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ON OPHTHALMIA.

BY

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Assistant-Surgeon Royal Artillery.

Ophthalmology

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From Dr. Beale's Archives of Medicine, No. XI, 1862.

ON OPHTHALMIA.

By Jeffery A. Marston, M.D., Assistant-Surgeon Royal Artillery.

THE subject of ophthalmia, as it prevails in the army, is brought before the profession because it is conceived that erroneous impressions are very generally entertained with reference to one, at least, of its most common forms.

While some would seem to include all conjunctival disease under the one head—conjunctivitis—and would explain the different appearances and morbid states, by a reference to the different degrees of inflammation existing in different cases, tracing the phases of the disease from the simpler elements of the most trifling vascular reaction, upwards to the more intense purulent inflammation of the membrane; there are others who perceive in the ophthalmia of armies an altogether specific affection. These latter regard the conjunctivitis ordinarily attacking the soldier as a disease *sui generis*, having a special etiology, running through a different course, and marked by such symptoms and pathology as entitle it to be ranked separate and distinct from the conjunctival diseases ordinarily prevailing in civil life.

Military ophthalmia, uncommon in England, but only too prevalent abroad, is hardly ever seen at the various ophthalmic institutions, at a period corresponding with its primary or early stages. The cases, such as present themselves at ophthalmic hospitals, are suffering from advanced forms of the malady, when any analytical examination into the nature of the changes and progress of the disease in the elemental structures would be futile, both on account of the extensive alterations in the palpebral conjunctiva, as well as the various other morbid lesions which have arisen.*

To the report of the "Congrès d'Ophthalmologie de Bruxelles, 1858," I am indebted more particularly for my first acquaintance with the true import of the phenomena, which I had long observed, in the disease in question.

It will be necessary to premise a succinct account of the histological anatomy of the palpebræ to render the succeeding remarks intelligible.

Besides the loose layers of skin extending over the eyelids; the pale muscular fibres of the orbicularis; the tarsal cartilages with their Meibomian glands, we have the lining membrane, or conjunctiva. This belongs to the class of membranes having a laminated pavement epithelium. The free surface is covered with a layer of epithelium of flattened, polygonal, scaly appearance. The cells are very clear, large, $\frac{1}{500}$, $\frac{1}{1500}$, to $\frac{1}{2000}$ inch in diameter, with distinct oval nuclei, and refracting nucleoli; the long diameter of the cells of this free surface is, for the most part, parallel with the long diameter of the lid, their edges appearing to be not only apposed, but even overlapping one another, forming a laminated pavement. As we pass deeper, the cells, still polygonal, are smaller, and tend to the spheroidal form, to which configuration they conform in the deeper layers. Those in immediate contact with the papillary structure, have, more or less, a vertical arrangement, are much smaller, and of the character of enlarged nuclei. They lie embedded together, and capping the sides and apices of the papillary structures, the wavy, undulating ridges of which they follow and serve to map out. These cells are supported by a layer of submucous areolar tissue, analogous to that of the tunica nervea of mucous membrane, or the dermis of the skin. This investment—in which the vessels and nerves ramify—is composed of an indistinctly fibrillated substance (commingled with yellow fibre in sparing proportion) disposed in areolæ. The superficial portion of this layer differs from the deeper only in the closer arrangement of the connective tissue, the smaller size of the areolæ, and the prolongation of the fibrillated tissue into conical, rounded, or oval elevations—the papillæ.

Upon the tarsal portion of the membrane, the papillæ generally have a simple conformation, are small, and more or less cylindrical or conical. At the retro-tarsal reflection however, the conjunctival membrane not only becomes much thicker, from containing a larger amount of connective tissue, but is at the same time looser in its texture and connection with surrounding parts, to allow of the different movements entailed upon this part of the lid. Here the papillæ are much more compound in structure. They are larger (as much as $\frac{1}{10}'''$ long) and assume a warty or fungiform character, from the production of secondary papillæ, closely placed and conical, thus resembling the fungiform papillæ of the tongue.

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* Mr. Dixon, in his Contribution to Holmes' System of Surgery upon Ophthalmic disease, does not allude to the premonitory and pre-existing vesicular state of the lids, as a most fruitful source of granular lids.

The papillary layer is developed from the fabrillated connective tissue which is prolonged into more or less conical or columnar projections. The connective tissue can however only be traced into the bases of the papillæ, whose conical apices appear almost entirely composed of a homogeneous-looking substance and small spheroidal epithelial cells. The papillæ have an arrangement in rows, parallel to the long axis of the lid. I have been unable by any reagent to develope a basement membrane, supporting the epithelium. The whole of the submucous tissue is a highly vascular nervous structure. The course of the nerves is easily determined in sections treated with soda.

In the retro-tarsal region of both lids there exist a few compound acinose glands, viz., those so well described by the two Kraüses. They are best seen in that portion of the connective tissue layer immediately subjacent to the epithelium and papillæ, where the aerolated tissue is laxer and less closely attached to the subjacent textures.

They conform to the racemose or conglobate type, are but few in number, and open by small ducts upon the free surface of the lids. These little glandular bodies range from $\frac{1}{5}$ to $\frac{1}{25}''$ in size.

The small flask-shaped open follicles discovered by Manz, and subsequently by Stromeyer, in the ocular conjunctiva near the cornea, do not exist, as far as my observation goes, in the palpebral portion of the membrane. It is interesting to note that these little bodies are found at the exact site at which the so-called phlyctenulæ of strumous conjunctivitis make their appearance.

In addition to the compound acinose glands of Kraüse, others have been described, both by Van Roosbröeck and Bendz—a system of small, saccular, closed follicles or mucous cypts. As these observers consider them to be the special seat of important pathological changes we must advert to them.

Van Roosbröeck in his researches into the causes and pathology of purulent ophthalmia, published many years ago, pointed out the important changes ensuing in certain glandular and closed mucous follicles, the existence of which in very great numbers, he declared was part of the normal structure of the palpebral portion of the conjunctiva. Bendz, whose observations are of the most valuable and important character, states "that the little glandular bodies are closed sacs (filled with cells, nuclear particles and fluid,) hardly appreciable to the eye, but apparent to the microscope: round or ovoid, of a whitish colour, surrounded by an amorphous opaline membrane, and seated in the vascular corium." He describes, indeed, two kinds of these glands—the simple and agminate, analogous to the intestinal glands. He speaks of the agminate variety being pretty constantly present as a patch near to the external canthus. He decided, too, that these follicular organs were limited to the palpebral conjunctiva. The small vesicular looking bodies represented in the accompanying Plate, and which, as we shall see, play so important a part in soldier's ophthalmia, Bendz conceives to be neither more nor less than these bodies affected with a specific morbid process and deposit. Recognizing thoroughly the specific characters of military ophthalmia, he proposes to call these granular bodies *glandular*, to distinguish them from the ordinary *papillary* granulations.

If we minutely inspect the lining membrane of the eyelids of the men of a regiment serving in the colonies, we shall observe upon some of them small raised bodies, like Sudamina or Herpes. In one man there will be but two or three such, and these very transparent and limited to the outer canthus; in another, the conjunctiva will appear as it were the seat of a vesicular disease, such as "Herpes," so studded will be the membrane with these bodies.

Müller and Eblè directed the attention of the profession to this vesicular-looking disease years ago.

From repeated examinations I am not convinced that the agminate follicular organs described by Bendz have any physiological existence.

Minute saccular bodies can be discovered in the tissues lining the lids by the process recently described by Kraüse, jun. This observer prepares his specimens by soaking the eyelids in acetic acid for three days, by which all the epithelium is removed. The very minute whitish prominences which then appear, are to be removed by the aid of scissors—transferred to a slide and steeped in glycerine. The subsequent addition of liquor potassæ brings out the reticula.*

It is in the highest degree probable that the vesicular looking bodies, sparsely shed in the palpebral conjunctiva, are these follicular organs, altered by disease. When, however, the disease has continued for any time, or advanced to any extent, it will be found that these vesicular bodies exist in such disproportionately large numbers, and often in such superimposed strata, as it were, as to lead to the conclusion that they cannot *all* have had their origin in pre-existing follicles. The appearance of follicles is exactly mimicked by the morbid products in the connective tissue, and, in diseased lids it is extremely difficult to determine the one from the other.

By removing one of the vesicular-looking bodies, teazing it out, and using a low power (one inch) we observe a round or oval-shaped granular mass, dark-looking and opaque in the centre, passing off into a lighter shade towards the periphery, where the colour almost abruptly fades into that of the neighbouring part of the fibrillated-looking stroma, upon which the vesicle appears as a little ganglion or knot. By placing the object under a quarter inch, we can trace exactly the limits and character of the new products. This little knot will be found to correspond to one of the interstices, or minute areolæ, naturally existing between the connective tissue elements. In this vacuole or mesh, we have an outgrowth of new cells—the cells, nuclei, and granules of all sizes, being massed together in luxuriant growth. The number and mutual aggregation of these new growths give, in a coarse section, an opaque appearance, from transmiting the light imperfectly. Around this, and further from the focus of the disease, we observe the white wavy tissue, granular-looking, ill-defined, and with indistinct outline. Now this little nest of cell-growth so defined, exactly assimilates to a follicle, filled with granular and cell contents, and is really nearly identical in appearance and constitution with that vesicular-looking condition which the mucous follicles of the colon assume in incipient dysenteric disease.

These sago grains (as they have been called) when latent and most vesicular in appearance, are nevertheless unlike the vesicles of Herpes, Scabies, or Sudamina, inasmuch as they cannot be emptied. However liquid their contents may appear, pricking them will not cause their collapse.

When such an one is removed and examined, while still fresh, it is evidently succulent, the little celloid and nuclear particles, making up the small knot or vesicle, move upon one another and alter their position by pressure (within certain limits of course), showing the presence of a certain amount of fluid.

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* Vide Plate xiii., fig 5.

When these sago-grain granules have passed through their vesicular and succulent stage, and become only part and parcel of that granular state, common to all the textures of the conjunctiva at a late or chronic stage of the disorder, their progress cannot be easily traced, from the fact that we are not sure whether we have an advanced stage of the sago-grain granule, or a fleshy outgrowth from the papillary and other parts of the connective tissue structures.

Often, however, the vesicles are sparsely shed from the first, and run their whole course to a firm fleshy condition, with little or no affection of neighbouring parts. I have removed them under such conditions, and they range themselves under two heads.

1st. Those in which the cells remain large, unduly round, and numerous in amount, appearing to be increasing rapidly, with numerous globular nuclei. The cells of the epithelial layer about such have departed from the normal character, and bear evidence of rapid local increase;—are spheroidal, with granular centres, like exudation cells, and, as we approach the free surface, possess the characters of pus. There is an entire absence or paucity of fusiform cells in this variety, and the granules, as a whole, form an exuberant fungous growth, succulent in appearance, and rapidly degenerating into muco-pus at the surface.

In the second variety the fleshy granule may appear almost vesicular in the centre, while it is dense, firm, and of a dull red at the circumference. These have fewer spheroidal nuclei and cells of small size in the central portion, corresponding with the less opaque part; while at the circumference the cells have become fusiform, or show a tendency to become oval and elongated at the extremities, conforming in character to the connective tissue layer, into which they doubtless pass.

As far as I can judge, my observations and examinations, would lead me to suppose that this forms the stage of arrest or cure. This would appear to accrue from the development and contraction of the fusiform cells, while the more active and succulent nuclear particles remain as such, ceasing to generate unduly, or become absorbed.

Minute vessels can be easily traced in both varieties, but the first yields by far the most blood on section, judged by the number of blood globules in the field: while the latter yields fewer but more distinctly traced vessels. Indeed, a certain vascularity, around the margin and in the neighbourhood of the outgrowth, can be seen with the naked eye, and more easily traced with a lens, in those fleshy sago grains undergoing the process of arrest and cure.

When numerous little crypts of this cell formation and nuclear aggregation existed, divided and intersected by the penetration of connective tissue, the whole had exactly the appearance of a Peyerian follicle, upon a miniature scale.

When the sago grain granulations disappear in the more advanced stages of the affection—becoming merged in the generally hypertrophied condition of the inner aspect of the lids—the disease may remain in abeyance, with an occasional recurrence of sparsley shed vesicles, which remain for some time as such—become absorbed—or run through a slower grade of morphosis, according to the continuance of vascular excitement or not. The vesicular bodies could hardly reappear if they all had their seat in a specific physiological structure, because that would have been destroyed by the pathological changes going on in it.

Their reappearance is traced thus:—In the interior of a chronic granulation, the central cells begin to grow, multiply, become vesicular, succulent, loose in arrangement, and mixed with granular matter; while the cells upon the periphery retain their character of fusiform cells.

In those eyelids in which the disease is very small in amount, it is limited to the retro-tarsal fold at the outer canthi.

It is noteworthy that the disease appears to select the immediate neighbourhood of the acinose glands described by Kraüse. Upon two occasions, in examining sago grain bodies from this part, I discovered portions of the gland structure, bordering upon the morbid growth. It is almost certain to my mind that these glands commonly undergo some changes in granular conjunctivitis, as they appear hypertrophied, and are more easily found in morbid than healthy eyelids.

Pathology and Symptoms.

1. *Vesicles.* Slight gumming of the lids.
2. *Vesicular congestion.*—Sight weak; lacrymation in a bright light; muco-purulent shreds on lower lids.
3. *Vesicular exudation.*—First stage of granular conjunctiviti~~e~~s, *i.e.*, the stage when it is readily observable, and most usually comes under treatment.
4. *Purulent Ophthalmia.*—Not common.

5. *Granular Conjunctivitis.*—Usually seen when the disease is endemic:—purulent ophthalmia when epidemic.

The vesicles appear as the *primary lesion, and are the very first products generated by the morbific agency.* That these are not the sequelæ of an inflammatory process,—but rather the powerful predisposing causes to, and modifying agents of, any inflammatory phenomena that may ensue, appears certain.

In the first stages the enlargement and permanence of the vesicles are the only evidence of the disease. On depressing the lower lids, they may be seen scattered like sudamina, over the conjunctival folds,—grouped around the canthi,—or studding the whole retro-tarsal region. In appearance they closely resemble saccular glandular bodies. They lie immediately beneath the epithelial layer, upon and in the connective tissue of the conjunctiva. These bodies are eminently chronic, and may remain an indefinite time, or be absorbed, to be succeeded by others, particularly if the subject of them remain exposed to the same influences as generated or fomented the disease,—a circumstance which is unfortunately but too frequently the case with soldiers.

When dying off, one often sees them larger, more scattered, and though still transparent, of a brownish hue, with one or more small varicose vessels running across them. The upper lid is frequently free, or affected in a less degree,—no congestion, lachrymation, nor pain, indicating their presence. Perhaps when attention is directed to the point, gumming of the lids at night, and occasional itching, may be made out. There may be, and generally is, an absence of all subjective symptoms, and it requires a minute inspection of the internal aspect of the lids to discover the vesicles.

The presence of these vesicles in a great number of soldiers without attracting any attention, or producing any morbid symptoms, and the contagious nature of the disease, are a sufficient explanation of the great difficulty attending the extirpation of ophthalmia when present among troops.

The disease frequently stops at this stage, especially when the conditions favourable to its development are wanting. Out of 861 convicts examined at Gibraltar there were—

Vesicles	441
Granulations . . .	46

The remaining 374 were quite sound, excepting those in hospital (about 45), who were not examined.

Vesicular congestion is very common, and may be induced by friction, dust, cold, wind, &c.

The conjunctival congestion gives pricking pains, (or more likely sandy irritation,) with weakness of sight in bright light, muco-purulent shreds on lower lids, and no great change in the vesicles themselves, (though they of course share the general congestion of the conjunctival mucous membrane).

Rest, in the shade; fomentations, cooling lotions, and a purge soon restore the eye; the vesicles remaining as before. In this quasi-inflamed state, a little winking in the sun, a gummy state of the eyelids in the morning, a collection of altered secretion,—forming in short a slight blenorrhagia,—occur. Let such a case be exposed to a long march, to much exposure to sun, dust, alternations of temperature, a debauch, guard mounting, night dews,—and an active stage ensues, a congestion of the palpebral conjunctiva. Effusion of plasma from the vessels, alterations of colour, opalinity, and alterations in the size and character of the contents of these sago grain granules, which, losing their pellucidity, become more and more opaque, red, and at last fleshy. At the same time the papillary bodies become affected and rapidly develope and degenerate upon the two lids—leading us to

Vesicular Exudation is the most important stage of granular conjunctivitis.

The watery bluish-red eye, the œdematous, half-closed blinking lids, and sniffling nose, plainly tell their tale of pain, intolerance of light, and inflammatory action in the lids; and now is the time that frequent inspections, with prompt and judicious treatment, will save the sight of many eyes, and months of wearing pain. There is no mistaking the disease. It is imprinted on the sufferer's face; depress his lower lids, and the palpebral conjunctiva starts into view, thickened, engorged with blood, and studded with numerous vesicles, passing through the successive phases of inflammatory action. They *become larger* by increased local growth, (hyperplasia) and seem more numerous, as those more deeply seated swell out and press to the surface;—small bloodvessels crowd around their bases, and creep over their surface, or penetrate into their interior. The effused fluid becomes pearly and pink from commencing organization, and finally the vesicle loses all specific character, and shows itself a true granulation. Papillary granulations also form in the lower lid, and the tarsal bodies of the upper lids are reddened and bristling with very fine papillary granulations, increasing in number and size, towards the canthi.

Purulent Ophthalmia.—This is not very common, when the disease does not prevail in an epidemic form. Cases, however, sporadically occur. Of course the disorder may advance at once from the initiative vesicular stage to the purulent, without passing through any other (at least observed) stage of the disease, if the exciting causes act with sufficient intensity, and the conjunctival membrane in an equal degree responds to the morbid agencies. In the course of a few hours, a case of congested vesicular lids may pass into an acute purulent ophthalmia, as I have myself witnessed. There is great photophobia, the eyelids are œdematous; their scarcely apposed edges stick together, with morbid secretion. As soon as the lids are separated, a gush of tears and muco-pus flows from beneath them. The lids, partly from their great weight, and partly from spasmodic action of the orbicular muscle, cannot at all, or with difficulty, be separated sufficiently to expose the ocular membrane. The ball of the eye is involuntarily rolled upwards and inwards, concealing the cornea beneath the upper lid.

The ocular conjunctiva is swollen and œdematous (chemosis), and what can be seen of the cornea appears as a deeply depressed circle within the raised roll of conjunctiva. There is intense vascularity, the conjunctiva being of a scarlet hue. If the chemosed membrane be seized with forceps, drawn out, and strips cut out of it, the exudation escapes with difficulty, owing to its consistence, and in a few hours the chemotic swelling will appear as bad as ever, even if it subside after the incisions. In this condition the tendency is directly to sloughing of the cornea, or rapidly extending ulceration, escape of the aqueous humour, staphyloma iridis, with dense cicatritial tissue, keratitis, albugo, or some opacity of the cornea. In passing, it may be remarked, that if strong caustics be avoided, and copious local depletions be employed at first, these opacities clear away wonderfully in time; even the worst looking of them greatly improve, from gradual absorption of the circumferential opacities around a cicatrized ulcer,—for much of the opacity is the result of a diffused inflammation and infiltration of the superficial layers of the cornea, or mere loss of transparency, from stretching and deranging that parallelism existing in the lamellæ of the cornea proper, the maintenance of which is essential to its transparency.

As the disease recedes, normal epithelial cells begin to cover the hypertrophied conjunctiva and its papillæ. As cure becomes established, the cells which have been so rapidly produced, during the progress of the disease, assume the spindle-shaped form, become fibrous in character and shrink;—while the projecting villi become more and more smoothed down, the vascularity diminishes rapidly, and the lids appear smooth, and of a dull red aspect, rarely, if ever, perfectly returning to the normally pale state, (if the patient remain in the same climate,) and prone to take on active local progress upon the slightest irritation. They cease at last to cause corneal disease from attrition of that structure, and a certain feebleness of sight only may remain.

This state of things does not obtain in the gonorrhœal purulent ophthalmia, a disease if anything more acute, and as much marked by all the morbid tendencies to corneal implication as the military purulent form, yet more rarely treated, and tending to a perfect cure, without the hypertrophied state of the conjunctival membrane remaining,—as a granulated, dull red mucous membrane,—such as it invariably does in the latter.

I state this as the result of observations obtained from treating cases of the two diseases in officers and men, at the same periods. In gonorrhœal ophthalmia the tendency is to the occurrence of a crescentric ulcer affecting the cornea, near its lower edge, while intense military ophthalmia gives rise, (a hazy state preceding or not,) to sloughing of that membrane.

Granular conjunctivitis almost invariably affects both eyes, either from the first, or during treatment. This is the result of the acute forms, such as the last, or arises in those who have passed through the stages described in a less acute degree. The whole of the structures become involved, both papillary, connective tissue, and glandular. The eyelids are œdematous, the patient walking about with them closed entirely, or but slightly open. They stick together with the morbid secretion from both the Meibomian and Kraüse's glands, with all the results and concomitant symptoms attending the hypertrophied and granulated condition of the membrane, modified according to the degree of vascularity that may be present. The now granular surface, rising up the epithelial structures, becomes the source of a morbid excretion, aqueous, muco-purulent, or purulent. The epithelial cells cease to cover the papillary layer, spheroidal ones taking their place, and becoming rapidly exuviated by the development of the deeper granulation cells. The upper lids become covered with soft succulent strawberry-like projections, massed together, especially in the neighbourhood of the angles, and retro-tarsal fold, where Kraüse's glands exist, while in the lower lid, the granulations are more regular, villous, pilose, and less spongy. Such granulations resemble those of an ordinary granulating wound; the superficial ones passing off as pus, while the others remain crowded together, one upon the other. The sense of the presence of foreign bodies is always present. Photophobia, the contracted brow, and confirmed ophthalmic aspect, become typically marked.

I have observed that the features tend to waste, disproportionately to the remainder of the body. The nose (particularly in those who have long ones), shows this wasting, and the patients themselves, from the disease and confinement combined, assume a chloro-anæmic aspect, suffer from dyspepsia, and become pot-bellied;—the cornea gets implicated, keratitis, pannus, or ulceration ensues, and one may perceive occasionally the posterior elastic membrane of the cornea, projecting as a hernial protrusion through the ulcer, yielding before the aqueous humour and threatening momentary rupture, which, however, it generally escapes.

As the disease assumes a more chronic form, the discharge diminishes, and is observed as a narrow film, along the palpebral sinus. The conjunctiva assumes a dense fleshy aspect, of a dull brick red, or brownish hue, in which state it long remains. Upon depressing the lids, the parallel arrangement of the granulations becomes obvious, little furrows or lines of separation appearing along the long border of the tarsal cartilage between the lines of granulations.

As these granulations diminish in number, size, and density, the deeper cells assume the spindle-shaped form, whilst absorption of the liquid and semi-organized products rapidly advances. During such retrocession of the symptoms the sago grain bodies may reappear and disappear. However protracted the case, the disease makes in the end wonderful improvement, and the lids, in very many cases, return to a nearly, (though hardly ever a perfectly) normal state; a few vesicles and granules remaining to mark the disease, while the eye is very prone to fresh inflammation and relapse. If caustics have been freely applied, or the fleshy granulations pass off by a molecular disintegration, we find minute depressed cicatrices, with little white lines running from these,—(stellate cicatrices).

Diagnosis.—Undoubtedly not all military ophthalmia is of the vesicular form. A neglected catarrhal ophthalmia may go on to granular lids; and the strumous variety of conjunctivitis, which is very common in the army, tends to a purulent ophthalmia and granular lids. Indeed, ordinary conjunctivitis, in delicate subjects, frequently produces a granular state of the palpebræ and chronic ophthalmia, without having ever been preceded or accompanied by the vesicular granulation. My own experience would lead me to infer that the catarrhal form rarely becomes purulent, and seldom affects the lids, and that granular lids are the products of either the strumous or vesicular varieties.

The vesicular granulations, which are the primary stage of the disease, are absolutely characteristic. The diagnosis will hinge upon the following considerations:—that the inflammatory reaction of the conjunctiva follows their presence and development; that such vesicles may exist for a long time alone without any other objective symptom; that the subjective symptoms are very slight, and are dependent upon the amount of inflammatory reaction, and not upon the presence of the vesicles. In the catarrhal disease, the subjective symptoms are early evident, the ocular conjunctiva is attacked as well as the palpebral, the vesicular granulations are not present, at least in the early stage, and may be absent altogether, or only appear at a later date, when the conjunctival inflammation has existed for some period; that if they appear, they are symptomatic of such conjunctival disease, constituting a secondary, inconstant, and fugitive phenomenon, and never developing into confirmed fleshy granulations, or becoming chronic. That the catarrhal disease arises spontaneously during the action of some catarrhal cause, as a special atmospheric constitution. That it is not (*per se*) contagious, nor infectious, nor limited to certain corps or bodies of men; while the military form attacks a great many men, a single regiment, troop, or a particular room;—affects the lids, begins, and often for long continues, with vesicles;—is essentially chronic, going on to fleshy granulations, and does not cause an injected globe, but is limited (primarily at least) to the lids.

Prevalence of the Disease.—The scourge that ophthalmia proves to troops serving abroad, and to bodies of men, gregarious in their habits and mode of life, is only too well known, and as far as the Mediterranean stations are concerned, may be seen by a glance at the following analytical tables.

I have to thank Mr. Nesbitt, late of Her Majesty's Convict Establishment at Gibraltar, and now Surgeon to the Wolverhampton Hospital, for the following tables. He has also placed at my disposal an admission and discharge book of all the cases of ophthalmia occurring among the convicts from 1846 to 1859, with copious details as to causes, symptoms, duration, and treatment in each case. I stand indebted to him, moreover, for furnishing me with the results of his very extensive experience and careful observations.

The establishment consists of a hulk—the "Euryalus"—well ventilated, clean, and with good washing tanks. A prison, on shore, built of wood—a long low building, four feet above the level of the sea, to which it is open upon the north-east aspect. The prison is well drained and ventilated in itself, but occasionally offensive from decomposing seaweed, and the accumulation of ordure about the mouths of the drains from the south part of the town, which debouch in front of the building, and disgorge immense quantities of filth after the rains of the spring and fall of the year. On the land side, the prison is bounded by a lime wall, a few feet behind, and rising to some height above it. The building is two stories high, each story being divided, by a wide corridor, into rooms or classes, constructed to hold sixteen men each, with a water-closet and washing apparatus to each. The men were too closely packed, and, when the hammocks were hung, they touched one another. The hammocks are rolled up during the day, and placed upon a shelf in the class. In 1859, the old washing-places, with a liberal supply of water, were removed, and inclined wooden troughs substituted—sixteen men washing in the same filthy water, which was afterwards used for cleansing the floor. The convicts rise early, bathe constantly during the summer, are clean in their persons, well fed, and slightly worked. From the perfect regularity and forced temperance of their habits, they are remarkably free from syphilitic and epidemic disease, as a rule. Typhoid fever, intermittent, and cholera, have however appeared among them at different times.

The Garrison of Malta.

RETURN showing Ophthalmia for 10 years, 1850—1860.

Years ending 31st March.	Strength of Garrison (average)	No. of Ophthalmic cases admitted.	No. Invalided for Ophthalmia.	Ophthalmia to strength per 1,000.
1850	3171	203	5	64·017
1851	2917	223	30	76·44
1852	3196	268	7	83·86
1853	3157	218	4	67·79
1854	3803	285	22	74·93
1855	3213	222	10	69·09
1856	1741	133	5	76·28
1857	7239*	1486	22	205·27
1858	6160	958	73	155·5
1859	4899	534	58	108·96

The *expeditionary* force is not included in this return, no correct returns could be obtained from the Italian Legion.

* Caused by the arrival of nine regiments from the Crimea.

Nature of the Disease.

Etiology.—Bendz considers soldiers' ophthalmia a purely local affection, residing in the conjunctiva of the lids, and due to a peculiar contagious principle, of which we know not the nature nor vehicle; that the disease takes on a specific form, though somewhat variable, and by predilection attacks the mucous glands? of the palpebral conjunctiva, secondarily affecting the papillary bodies of the lids, spreading by contagion, and, most frequently, by miasmatic means (*i. e.*, infection through the air), more rarely by more immediate or direct ways. It does not appear capable of spontaneous development under the influence of ordinary atmospheric conditions. He terms the affection an "adéno conjunctivite des paupières," of a specific form, and believes that the primary action of the virus, or contagious principle, is upon his so-called vesicular glands.

The disease is endemic in Denmark, Belgium, and Ireland. It prevails also in Malta, as I have reason to know from personal observation, in addition to the ordinary catarrhal and strumous forms of conjunctivitis. The question arises at the outset—Can an intensified catarrhal ophthalmia give rise to the so-called vesicular granulations? It is, of course, extremely difficult to exclude the possibility of any given case of catarrhal ophthalmia not having been affected by a pre-existing sago-grain granulation in a slight degree, particularly as it is certain that an ordinary catarrhal conjunctivitis, arising in one the subject of the vesicular bodies, directly tends to assume the chronic form, and become purulent or granular.

If a pure catarrhal conjunctivitis does generate this peculiar affection of the lid, it must do so very rarely indeed, and under circumstances which are themselves powerful predisposing causes of the disease, viz., among men gregarious in their mode of life, and subject to the evils of overcrowding, infected air, and defective ablutions, &c., for it is very rare to find the disease generated among the officers, their families, and the women of a regiment, although they are subjected, equally with the men, to the catarrhal forms of the malady.

The injected and irritable state of the palpebral conjunctiva to which officers are liable from the prevalence of wind, dust, glare, &c., presents a very different disease from that induced by the same exciting causes among the men; the disease contracted by the former has, with rare exceptions, a different course, appearance, and is much more amenable to treatment. The lid of an officer affected by inflammation from these causes is much injected; the Meibomian ducts are here and there filled with concreted secretion, and the epithelium appears raised into exceedingly minute prominences, very closely aggregated together, (the merest points) and never of the large size, and sparsely shed, semi-transparent, sago-grain granulation, observed among the men.

An officer, who kindly sketched some vesicular lids for me in August, 1860, was tempted to look into his own eye, and there, sure enough, were three or four vesicles at the outer canthus of either eyelid. My attention being called to the circumstance, I took the opportunity of examining all the officers' eyes, but they were perfectly healthy, with this exception.

The vesicles in this officer's lids remained quite latent until the spring of the present year, when, (after exposure to a moist wind and dust) he got catarrhal ophthalmia. The conjunctiva now took on the form common to soldiers; numerous bodies of a similar character were rapidly evolved, and he is now the subject of granular lids.*

Defective Hygiene.—There must have been some cause, or plurality of causes, operating in order that the first case, whenever and wherever it arose, should have made its appearance; and it would be going very far to deny that a similar combination of causes should not arise again, and generate the disease, irrespective of contagion. The disease seems to have some intimate connexion with miasmatic influences, and my own experience and observation would lead me to infer that it prevails with diseases incidental to bodies of men exposed to malarious and effluvial emanations. The convicts in Gibraltar, however, seemed to be tolerably free from diseases of an epidemic type. In Malta, on the contrary, the barracks in which ophthalmia appears, yield other disorders. Typhoid or enteric fever, gastric remittent, rheumatism, and certain forms of febrile dyspepsia are common at the same time, or at different periods of the year, and during different years in the very same barracks, which yield long lists of ophthalmic disease.

It must ever remain a difficult problem to solve, the question of the causation of the disease, because, when once generated, it is so liable to spread in a regiment; even in healthy localities, where men live together, the means of ablution and ventilation are necessarily somewhat limited; nevertheless, I have no doubt that the sago-grain granulation may arise *de novo*, from the operation of the self-same conditions as obtain in miasmatic disease, using the latter term in the general sense.

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* Qy. His military servant had the disease in a latent form.

Some facts lately furnished me by Staff Assistant-Surgeon Dr. Frank, (himself an expert histologist, and most trustworthy observer), have a direct bearing upon the generation of the disease from unhygienic influences.

"Stromeyer found in pigs living in an unhygienic state that such grey granulations were commonly present upon the lids: between the manner of whose living, &c., and that of some men, so many connecting links may be pointed out."

Stromeyer, (and some scientific men connected with him) conceived the idea of examining the conjunctiva of animals with the view of setting at rest the question of the presence of the closed mucous follicles described by Bendz. They examined 1,000 eyes of different animals, domestic and wild. Stromeyer found that no physiological organs corresponding with the sago-grain granulation existed in pigs well tended: to wit, in pigs having "a bedroom and parlour," and clean litters; he therefore infers that they are pathological or neoplastic formations.

Stromeyer concludes that Bendz, (who had the assistance of his brother, the anatomist at Copenhagen) must have examined conjunctivæ at a time when granular ophthalmia was epidemic in that city, and that his so-called follicles were in reality not physiological but pathological formations. Stromeyer's observations would seem to prove *that given certain unhygienic conditions, this kind of ophthalmia is almost sure to follow among domestic animals.*

Dr. Frank goes on to say, "I obtained some pigs' eyes the other day, and was pleased to find that they were pigs of the lower orders. The lids were in a condition of vesicular granulation."

I have myself examined the lids of some sheep, pigs, and goats, but have not been fortunate enough to find these vesicular bodies in any instance.*

As an illustration of the generation of the vesicular lids from the operation of natural causes, irrespective of contagion, I may mention the following:—An officer, with a family of eight children, occupied a large house in Malta; six of the children slept in rooms leading one from the other, with the female domestics. The day nursery was also occupied at night. The ventilation and lighting were bad, and there was effluvia from a drain in the kitchen. These six children had vesicular lids during the spring of 1860. The seventh child slept separately, and the remaining one was an infant. The six children, I learnt, were bathed in the same water. Attention to cleanliness, ventilation, &c., and the removal to a better house, completely eradicated the disease.

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* The etiological causes, which Stromeyer conceives to be productive of the disease, do not obtain here, for all the domestic animals live almost entirely in the open air. (Malta).

Ophthalmic disease prevails endemically in Malta, and I know that the follicular-looking granulations exist in very many of the inhabitants of the lower orders, among whom the strumous and catarrhal varieties are also remarkably frequent. The predisposing causes, dirt, effluvia, defective ablution and ventilation, are rife among them; while the exciting causes are to be found in the nature of the climate, the condition of the soil, winds, dust, and glare. Whilst in Gozo, I examined the eyes of a great many children of the poorer classes. These children work in the fields with their parents during the day, and sleep in the most wretchedly confined cabins at night. Vesicular lids were very common indeed, although conjunctivitis appeared to prevail less than in the crowded city of Valetta. When the parents accompanied their children, (as they invariably do, following all strangers for the purpose of begging) I instituted inquiries as to the number of children belonging to one father, and the impression left upon my mind was decided, that where there was a large family (5—8—10), this vesicular condition of the lids was remarkably prevalent, and out of all proportion to the amount of the same disease existing in a similar number of children belonging to different parents. The people are very poor, generally have large families, sleep in wretchedly confined cabins, frequently with their domestic animals, and, judging from the appearance of their skins, could not make use of much water for the purposes of cleanliness. They lead the most healthful out-door occupation, and are remarkably healthy in aspect, though ill-nourished.

So certain do I feel that the prevalence of vesicular disease of the lids is in direct ratio to the amount and degree of defective sanitary arrangements, that I conceive that the palpebral conjunctiva offers a delicate test and evidence as to the hygienic conditions of a regiment. This peculiar condition of the conjunctiva is also occasionally seen in ophthalmia neonatorum, where the conjunctivitis may depend in all probability upon the direct application of the vaginal discharges of the mother to the conjunctival membrane of her infant. Even then such application may be quite innocuous, except under the same unhygienic conditions which prevail with those who evince a peculiar proclivity to the disease. Indeed the "lochial atmosphere" of the room of a woman recently delivered,—its warmth, and absence of light and ventilation,—are in themselves sufficient causes for the generation of the disease.

What is the nature of the morbid agency?

Some of the men affected, have assigned as a cause the irritation caused by the products of urinary fermentation. Such a cause, however, can no longer exist. Before I had observed this disease, I well remember to have witnessed some facts among domestic animals parallel to those noticed by Stromeyer, which lend some support to this idea. Ophthalmia is not unfrequent in dogs, the apparent product of the irritation of ammoniacal fumes arising from the decomposing excreta in ill-tended stables. A large Newfoundland had a purulent ophthalmia, which was cured by removal from the stable, having previously resisted all treatment; what is still more corroborative of the truth of this, as an efficient cause in his case, the disease recurred upon the return of the dog to his quarters in the stable.

Unfortunately, at that period I had no knowledge of the relation of vesicular lids to ophthalmic disease. These facts must have been noticed and recorded by veterinary surgeons. It has been suggested to me that the emanations from the cloth, of which the soldier's uniform is made, may be a cause of the disorder in question. This is quite possible, (for I understand the cloths are prepared in a way as peculiarly offensive to ears polite), as is the stench which steams from them in a hot guard-room to sensitive noses.*

Parasitic.—My own observations afford no proof that these vesicular granulations have a parasitic origin. I have examined the scrapings of lids again and again, with this end in view, and invariably with a negative result. Wharton Jones's suggestion, that the prominent cause of granular lids might be an animal parasite, because the disorder is cured or relieved by the application of ung. sulphur, I have failed to endorse in any particular. First, the ointment gives in my hands results (identical, if not actually inferior,) to those obtained from other remedial agents. Secondly, microscopic observation fails to detect any such parasite; and the prevalence of the ocular disorder, where no scabies nor any parasitic disease prevailed generally or individually in ophthalmic cases, or during ophthalmic seasons. Of the diseases depending upon vegetable parasites, *e.g.*, sycosis, tinea tonsurans, herpes circinnatus, pityriasis versicolor, and porrigo, I may remark, that these have not co-existed with the ophthalmic disease in affected individuals, nor specially among the men of the room which the ophthalmic patients have inhabited.

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* The expense, trouble, and extreme care entailed upon any one conducting the quantitative analysis of ammonia in the air of a barrack room have prevented my determining this as a cause of the disease. Observations lately published point to something being done in this way.

During the spring of the present year, (1861) diseases of the skin and hair follicles, depending upon vegetable parasites, have been very prevalent, but ophthalmia has not only not been more but actually less, as far as the men of the Royal Artillery and Engineers are concerned, than during the same season of other years.

Is the disease an artificial or factitious one, produced by the malingering soldier?

It has not been clearly proved that the specific disorder in question, marked by the peculiar anatomical characters I have enumerated, has ever been, or could be generated by ordinary means of irritation. It may be, but *I can trace no reliable instance of its having been so produced.* That *an* ophthalmia may be so originated I have no doubt, but very considerable doubts as to whether *the* ophthalmia can be so induced. That where the vesicular disease of the lid, however small, is pre-existing, the more advanced stages of the affection can be produced, the local vascularity and irritability marvellously increased, and the disease protracted, by the application of irritants and friction on the part of malingerers, I am positive. Indeed, I may go farther, and state that I have, upon more than one occasion, had pretty positive evidence of such artificial production of a severe form of the disease from one of a slight character. In many cases the diseased state became aggravated, ameliorated, and again recurred, under circumstances so very suspicious, as to leave no doubt in my mind that the men had been tampering with their eyes. This is a far different thing, however, from asserting that all soldiers' ophthalmia arises in such a way. The fact of the disease being endemic to certain countries, its prevalence and intimate connection with European armies generally, the way in which it spreads, the periods of epidemic violence, the different classes of persons and sexes attacked by it, and the regular etiological history which it possesses, are a sufficient answer to those who totally disbelieve in soldiers' ophthalmia as a natural disease.

Occasionally, as I have shown, an officer may become the subject of the disorder. Women and children are frequently attacked. Non-commissioned officers, of steady character, long service, and occupying lucrative local posts, have been so attacked, while (what is a very strong proof to my mind), a few of the *convicts at the Gibraltar establishment, who had nearly completed their periods of transportation, were attacked with severe forms of the disease,* and their eyesight permanently affected. Some military surgeons have thought that the men might generate or aggravate the diseased action by applying urine to their eyes. It may be so, and indeed I know that it has been in a few cases proved so; but it is quite inadequate to explain more than a very small minority of the cases, on the one hand, and on the other, there can be little doubt that the operation of other causes are both adequate, and actually do, produce the disease.

Contagion.—There can be no doubt that the disease is both contagious and infectious. Many observers are inclined to think that the spread of the disease is mainly, if not entirely, due to such agency.

Bendz, of Copenhagen, relates the origin of the disease in the Danish army, in 1851, previous to which it did not prevail. From his statements, I gather it to have been imported into Copenhagen by some prisoners of war. When peace was concluded, the Danes recruited in Schleswig, and numbers of men who had previously served in the armies of the Duchies were received into the ranks of the Danish army. An ophthalmia, marked by the peculiar appearances described, appeared in the regiments into which the recruits had been received. What is still more curious, these troops were afterwards removed from Schleswig to Copenhagen, and this ophthalmia spread rapidly, disseminating itself among the civil population, apparently through the medium of discharged soldiers. Granulations among the men afterwards recruited were found to be very frequent, *e.g.*, in 1856, 320, out of 2,600 recruits, were found to have the disease in different degrees.

Mr. Nesbitt states that granular conjunctivitis has been the plague of the convict prison at Gibraltar ever since its formation in 1842. At first, when the men were fewer, and lived in well-ventilated hulks, abundantly supplied with water, the cases were rare and unimportant; but as the prison on shore filled, the numbers attacked gradually increased (*vide* Table), until at length the cases became so disproportionate, that the strictest investigation into its causes was entered upon by the medical officers. As a result of this inquiry, it was discovered, that out of the whole number of prisoners a very large proportion were suffering from the disease in its various stages; (*vide* Tables) that the ratio was less in the "Euryalus" than in the barrack; that there was a close connection between granular and vesicular lids; that those classes were free from the disease in which no granule had been confirmed, and that the great source of infection was from actual contact. In D. 9, one man (Eady) was alone found healthy, and upon inquiry he was found to be a cleanly man, who *never* washed in the ward, but waited until he could have pure water, and plenty of it. All the occupants of that class, which was the most infected of all, state positively that they were quite free from any ophthalmic taint until prisoner (Netts) was introduced and billeted upon them. This man, a careless Spaniard, was the great *foyer d'infection* from which the worst cases arose and spread. The prison itself was admirably adapted, by its imperfect arrangements, to disseminate the evil, and upon this point the shrewd and intelligent surgeon, in his Annual Report for 1859, speaks strongly. "I regret, however," he says, "to say that granular ophthalmia continues endemic amongst the prisoners. I have been unable to trace its first origin in the prison, but am induced to believe that it was introduced by some Spanish convicts, of whom several are received annually. It has most certainly been kept up by the unavoidable admixture of the men, and the faulty hygienic condition of the prison itself. In one or two instances whole wards have been attacked by the introduction of one infected prisoner. As far as I can observe at present, the disease is propagated, rather by actual contact, than by infection of the air. The great increase in the number of cases in the present year is to be attributed entirely to the confusion consequent upon the alterations which have been made in the prisons, for as the men live in wards, sixteen in each, *closely packed, they are compelled to wash all in the same trough, the same water serving each, unchanged, and then used to wash the floor.*" Time has not yet permitted a fair estimate to be formed of the value of the stringent hygienic measures adopted.* Vesicles are by no means quickly absorbed, and as long as infected men remain, so long will acute forms of the disease continue. Mr. Nesbitt conceives the vesicular disease to be the same as ophthalmia neonatorum, and that one will produce the other. He says that in February, 1861, he saw an infant with purulent ophthalmia, which quickly disappeared under the usual treatment. In the following month he attended the mother, (a woman in a very respectable social position) who was suffering from conjunctivitis of the left eye, evidently due to the presence of a number of vesicles in the lower lid, many of which were already passing through the earlier stages to granulation. The baby, he remarks, "rolled in a blanket, and stowed away under the bedclothes, breathing a highly concentrated "lochial" atmosphere, is in an excellent position for catching the disease, and slight carelessness, as the use of the same handkerchief, would suffice to transfer the disease to the mother."

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* Examination made in March, 1859.

Through the kindness of Dr. Forrest, Inspector-General of Hospitals here, I have inspected the reports of the medical officers of the regiments stationed in Malta during the prevalence of an epidemic of ophthalmia in 1856–7. From the report of the 14th Regiment, I learn that, in 1856–7, the number of ophthalmic cases was 226, out of a strength of 828 men. The history of the regiment, with regard to ophthalmia, is remarkably illustrative of the disease being of a contagious nature, and the tenacity with which it adheres to a body of men when once engendered among them. In 1848, the 14th Regiment relieved the 81st at Barbadoes, and occupied the same barracks as the outgoing 81st had done. This 81st Regiment was very unhealthy from ophthalmia, and the 14th Regiment, in that year, had 94 cases, out of a strength of 597. Ophthalmia prevailed in the regiment after its removal to Canada, as in 1842–3 there were 124 cases in 598 strength, the cases being chiefly, however, among those men who had previously suffered the disease in the West Indies. In 1849, the head-quarters of the *regiment in England was split up, with the effect of directly diminishing the amount of the disease. In* 1853–4 *there were only* 19 *cases in* 919 *strength.* The following facts were made out relative to the Malta epidemic of 1856–7. At the height of the epidemic, the regiment moved to a barrack vacated for them by the 28th Regiment, the men of which were not suffering. The disease not only remained unchecked, but actually increased in intensity, showing that there must have been other causes at work than mere defective barrack accommodation. The married soldiers suffered in the least degree—the officers' servants next. One officer only was attacked, and it is doubtful whether this was a case of the military form of ophthalmia. The women and children suffered comparatively little, and these from the catarrhal and strumous forms of conjunctivitis. To show that the exciting causes—sunlight, dust, variations of temperature, guards, &c.—were not the only and essential causes operating, we have the fact that the tailors of the regiment suffered equally with the other men, though exempt from such causes. As to the contagious nature of the disease, there are the following facts. *Direct contagion,* only one case traced—a woman and child, previously quite healthy, took the disease after a serjeant (the husband) had been discharged from hospital.

Indirect infectious influence? Eight tailors of the 28th Regiment, healthy men, were attached to the tailors' shop of the 14th. Two of such 28th men took the disease, the remaining six were thereupon removed, and did not take the disorder. The medical officer concludes a very elaborate report with an opinion "that however abstruse the notion may appear, he has been compelled by the facts to infer that a remarkable proclivity to take the disease is engendered among the men of a regiment wherein ophthalmia exists."

The 57th Regiment, stationed in Malta during the same period, suffered also from ophthalmia; 198 cases occurred; of which 30 were relapses. The regiment commenced to suffer ophthalmia at Balaclava and Kinburn in 1855–6, and the predisposing cause was therefore present. The married soldiers suffered little or nothing from the disease; the officers' servants almost not at all; the women and children slightly, the cases which made their appearance among the latter having a constitutional or strumous origin. Three married soldiers, previously healthy, became the subjects of ophthalmia after sleeping in a tent in which two men affected with the disease were quartered. The tailors of the regiment also suffered in an equal proportion with the other men.

The 71st Highland Light Infantry had not suffered from any ophthalmia in the regiment for years. The regiment was stationed in Malta at the period of the epidemic referred to. Only 23 cases of ophthalmic disease made their appearance. These 23 cases were apparently all catarrhal ophthalmia, for the average duration of treatment with them was only eight days; the conjunctivitis was common alike to officers, men, and servants, and prevailed at different periods in a sporadic manner. In none did the disease prove chronic, nor result in granular lids. The same exciting causes were in operation of course as in the other regiments.

The 28th Regiment suffered relatively little, no cases occurring among the officers, women, and children.

The Royal Artillery, Engineers, and Malta Fencibles were comparatively exempt.

During 1860, twelve men of the Royal Artillery have suffered from this form of conjunctivitis. Seven of them belonged to No. 3 Battery, and were members of the same mess (No. 6). They occupied 12, 13, and 14 rooms at Upper St. Elmo. A convalescent from hospital, perfectly free from ophthalmia, was exposed to the influence of an ophthalmic patient of another corps, and he had vesicular granules developed in the left eyelid. Two men belonged to a healthy battery, No. 8; one of whom, from the crowded state, of the rooms of No. 8 Battery compared with No. 3, were attached to the latter battery, slept in No. 12 room, using the basins, &c., of the men of No. 6 mess. One case could not be traced. The remaining two men belonged to No. 1 Battery (healthy), caught the disease whilst prisoners in the military prison. No. 1 Battery at the time had a separate fort from the other men of the brigade. The affected men in question gave the following history:—The military prison was in a very crowded state, so that many prisoners had to be confined in the cells at Upper St. Elmo. These prisoners were not marched down to the lavatory of the prison, but washed out of two tubs, the water not being changed for each man, so that from 20 to 40 men washed in this water. A prisoner (Private S——, 15th Regiment,) was one of the first to suffer from ophthalmia, and the affected men of the Royal Artillery stated that they washed in the water used by Private S——. Until their then present attack they had never suffered from "weak" eyes. At the time of writing this report a trumpeter is under treatment for vesicular lids from No. 12 room.

I may here advert to the strongest instance, of the spread of the disease by contagion alone, which has occurred within my observation.

A married officer, holding an important staff appointment, in opulent circumstances, and residing in one of the largest and best houses in Valetta, sent for me to see one of his children suffering from ophthalmia. I was surprised to find that the child had vesicular lids, and still more so when I discovered that nearly the whole family had indubitably vesicular lids, mostly in a latent stage. The English nurse was affected, also the baby. I next discovered that a native wet-nurse had *lids advanced to a chronic and confirmed stage of the disorder*; the baby slept with her. The children were frequently all bathed in the same water. An officer of the same department, who had arrived but a few days at the station, was temporarily put up in the quarters of this affected family. His nurse and child occupied the same *day* nursery, *but slept in a separate room,* and used *separate washing utensils.* They were *perfectly free from the disorder.* These facts leave no doubt in my mind that the native wet-nurse's lids were the "fons et origo mali" in the house.

Many cases were so very well marked that I made a point of bringing them to the notice of some of the military surgeons of the station.

I have seen one eye affected, and during treatment the other eye become so, apparently from the trickling of the water used in washing, or the tears, from the affected to the healthy eye.

As far as the Danish army is concerned, at any rate, there appears to be a greater proclivity in recruits and young soldiers, compared with old ones, to take the disease.

Dr. Bendz gives the following:—Garrison of Copenhagen, 4th battalion of line, 1855, received 340 recruits; of this number, 84 brought the malady, 41 had vesicular granulations without any inflammatory reaction, 35 had vesicles, with redness and vascularity, 1 confirmed or solid granulations, and 6 the catarrhal form of the malady.

Granting, as we must do, that the disease is both infectious and contagious, it must be stated that it is not so at all times and during all stages. The Belgian and Danish observers, with Von Græfe and others, seem to have tolerably satisfactorily proved this. Eble, who has written upon this subject, observes that different degrees of intensity in the inflammation set up by these granulations also produce different and proportionate degrees of severity in the inflammation caused by their contagious agency; hence, mild and severe cases, he thinks, ought to be separated. Although the muco-purulent stage and the stage of active local progress seem to be the periods at which the contagious properties are most developed, I nevertheless believe that there is not any stage at which the disease may not spread in the direct way, as by using the same water for ablution, washing utensils, &c.

Dr. Eiselt, of Prague, has recently propounded the theory that the infectious morbific influence is due to the presence of pus cells, floating in the atmosphere, surrounding ophthalmic patients. He states that by means of M. Pouchet's aeroscope (used for the detection of floating vegetable and infusorial germs), he has discovered pus globules suspended in the air of ophthalmic wards. An important discovery, if true, but inadequate to explain all the phases of the contagious properties of ophthalmia.

Treatment.—I would premise what I have to say upon this head by remarking, that it is only intended to indicate what my own observations would lead me to suggest, with a desire (as far as practicable) to avoid any unwarranted dogmatical and positive assertions.

Prophylactic measures.—These I regard as by far the most important, as indeed I have very little faith in any mere therapeutical influence we possess over the disorder. The measures to be pursued can be easily gleaned from the resumé at the end of this paper. Sometimes we can cause a sudden check to the progress of a threatened epidemic by finding out and removing the exciting cause, as has been well illustrated lately. The 2nd battalion 23rd Regiment removed to a barracks in Malta called "Polverista Gate." The name sufficiently indicates the prevalence of dust. Ophthalmia commenced among the men, and made rapid progress, but was quite checked by the common sense suggestion of Dr. Tydd, the regimental surgeon, viz., to water the roads and neighbourhood of the barracks.*

Time as an element in treatment.—It is astonishing what changes ensue in time, even in cases of the severest forms of the disorder. There is naturally a strong tendency to recovery. If strong caustics have been avoided, and there has been no tampering on the part of the individual, the disease, I am positive, ought very rarely indeed to eventuate in loss of vision. Protracted as recovery may be, it comes at last;—or at least so beneficial a change that the disease again appears latent, and is tolerated by the patient. The granulations smooth down, and become even. As the evidence of attrition diminishes, the corneal deposits altogether clear away, or leave behind trifling specks, where ulcers have cicatrized.

1*st Vesicular Stage* hardly admits of or requires treatment, further than perfect cleanliness, good air, removal from the exciting causes of conjunctivitis, the occasional use of a mild astringent wash. If eradication of the vesicles is aimed at, the removal of the individual entirely from a gregarious mode of life, and change of air, may procure that end.

2nd Stage.—A few leeches, or a larger number, proportionate to the amount of vascular engorgement; cupping; a purgative, with the use of a weak solution of alum; nitrate of silver (gr. ii.—iv., ℥i. aquæ) or bichloride of mercury, with extract of belladonna, as collyria; the frequent application of the eye-douche, or a refrigerating lotion constantly applied to the eyes, if the nervous irritability be great. These,—with confinement in a well ventilated ward, upstairs, and remote from hospital or sewage effluvia,—serve to remove the vascularity in a few days, though rarely the vesicles themselves.

My own opinion of local depletion is very high, if actively employed in acute cases, and not too long continued. The state of the eyes sympathizes with the general condition of the patient's stomach, &c., and there is a tendency in all stages for the patients to have dyspeptic symptoms, coated tongues, and pot-bellies, therefore the diet should be regulated, light, and without any stimulants. Treatment is highly successful in this stage.

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* That Vesicular and latent disease of the lids was present in the men of the regiment long prior to this I know from personal inspections of them.

3*rd Stage.—Vesicular exudation.*—The same remedies, and more vigorously applied, are indicated, particularly at the outset, but restrained by a knowledge that mere depletory remedies are both injurious and useless in the chronic stages of the disorder. Blisters prove useful; a very frequent use of the eye-douche; mild astringent collyria, mineral and vegetable, frequently varied; the use of glycerine at night to prevent gumming of the lids; exercise in the open air just before sunset, and sea-bathing. Quinine, porter, &c., only when the state of the patient requires their administration. An upstair ward is the best. Change of air, or the approach of wintry weather will often alone cure many cases.

4. *Purulent ophthalmic stage* (acute).—The plan in which I have the greatest confidence includes the following measures. The application at once of relays of leeches in large numbers; [redacted] cupping the temple; the administration of a purgative; belladonna ointment applied to the brow; collyria of alum (gr. v.—℥i.), nitrate of silver (gr. iii.—℥i.), frequently dropped into the eye, and the constant application of fomentation, or better, cold irrigation steadily maintained; the division of the chemosed membrane; such treatment to be employed during the first week, say. Afterwards the application of weak collyria (frequently varied), change of ward; blisters kept open; the use of quinine and stimulants, if indicated; segregation from other and bad cases; or perfect change of air. That the application of strong caustics, or strong solutions of nitrate of silver, &c., to cut short the disease, only tends to protract it, I am quite sure; and my impression is that the keratitis and corneal deposits are greater in those cases in which strong applicants have been used, than in others more temperately treated.

5. *Granular lid stage.*—The plan of treatment is somewhat similar to that of the last, but modified by the knowledge that we are treating a disorder essentially chronic, and one which spontaneously tends to recovery in process of time. Segregation from other cases, the removal from hospital air, abundance of cold water, and a strong faith in time as an element for good, are the most important items in my mind. As to the various collyria, caustics, and special modes of treatment, so strongly recommended and vaunted at different times, all I can say is, that I have never observed any facts warranting the slightest

reliance in any one of them. Fixing the lids over the eye, and so retaining them, only answers in cases wherein a suspicion of foul play exists. As to burning down and repressing redundant granulations, by sulphate of copper, lunar caustic, &c., I firmly believe, (what the careful analysis supplied me by Mr. Nesbitt teaches) viz., that we prolong the disease and complicate it by new morbid phenomena of our own production. It ought not to be forgotten that the disease is remedied by natural processes; that to remove the old granulations you must cauterize even to the tarsal cartilage, and that the affection improves not by a merely rapid liquefaction of the cell structures of the granulations, but by a change of such cells into a fibroid tissue, concurrently with the absorption of liquid and degenerating products, and the exudation of the surface cells as muco pus. During the whole treatment we must be upon the watch that the deeper tissues do not become implicated, that a syphilitic iritis is not also making progress, or that a sclerotitis or irido-choroiditis are not set up, for then in addition to mercury, copious local depletion, and division of the cornea, with evacuation of the aqueous humour, may be required.

The state of the conjunctiva affords, too, an index to delicate barometrical changes, if we are only careful to observe them, objective and subjective symptoms becoming markedly worse during the prevalence of easterly and southerly winds, with the moist, hot sirocco; on the other hand, such symptoms rapidly improve during the prevalence of polar dry winds, or westerly ones, and during ozoniferous winds, provided they be dry ones.

The application of liquor potassæ, as directed by Mr. Dixon, I have tried in two cases. That the alkali permeates the parts, and chemically dissolves the nearest tissues, is true enough, but its application is attended with great pain. Mr. Dixon speaks of six weeks being consumed in the treatment; my scepticism suggests that the six weeks and air were the curative agents rather than the liquor potassæ.

Resumé of the preceding paper in the form of propositions.

1. That the palpebral conjunctiva contains a well-developed and very vascular connective tissue layer, with the papillary structures, Meibomian glands, and an epithelial covering, consisting of numerous cells, pavement and polygonal upon the surface, spheroidal, smaller, and in successive layers beneath, besides ~~certain~~ numerous follicular compound or racemose glands (Krause's), situated in the corium layer.

2. That various forms of ophthalmia occur in military as in civil life, particularly the catarrhal and strumous forms.

3. That military vesicular ophthalmia is a specific affection, having always the same essential characteristic features, prevailing endemically or epidemically.

4. That it commences as an affection of the connective tissue stroma, or the cells (epithelial) placed in contact with that tissue in by far the larger number of cases; while in others, it is connected with the stroma immediately surrounding Krause's glands, in the form of vesicles. That such vesicles are not ordinarily the product of inflammatory phenomena.

5. That, although the so-called vesicular or sago-grain granulations may appear during the progress of other disorders, there is no positive evidence to prove that the catarrhal and strumous forms ordinarily generate the vesicular lid, but rather that the latter is a specific disease, which may precede, accompany, and modify any diseased state of the conjunctiva, with which it is conjoined; or that it arises concurrently with ordinary conjunctivitis, when the subjects of it are living in unhygienic conditions.

6. That the so-called vesicular lid may exist without any inconvenience or symptoms arising, and the disease may so continue in one stage and latent, for an indefinite period.

7. That, upon the occurrence of exciting causes, an inflammatory reaction occurs, limited primarily or throughout to the palpebral conjunctiva, conducting, according to its extent and duration, through all the phases and stages of the disease, from the slightest blenorrhagia, up to the most acute purulent ophthalmia.

8. That the period of maximum prevalence of the disorder is the first and commencing second quarters of the year. That solar heat, moist winds, white glaring surfaces which reflect light and heat; dust and frictions, and the heavy dews prevailing at this season, seem to be powerfully exciting causes. That the epidemic prevalence of vesicular ophthalmia during the spring and summer seems to be connected with the increased temperature, and the light rains, causing rapid decomposition, and evaporation of miasma.

9. That, although the disease rarely appears to occur spontaneously, it is more than probable that overcrowding, bad ventilation, and defective ablution, are themselves adequate to originate it. That the true vesicular ophthalmia has an intimate etiological relation with other miasmatic disorders, and that the state of the conjunctiva offers a delicate test of the hygienic state of a regiment. The prevention and removal of

this form of ophthalmia is therefore more within our control than is generally imagined.

10. That the most powerful cause of the spread of ophthalmia in a regiment is undoubtedly some morbid influence engendered by the presence of individuals suffering from the complaint. That the disorder spreads most frequently in the direct way; and the virus, whatever it may be, is of miasmatic origin, and falls within the laws of infection; such infection, proceeding from an affected individual in badly ventilated sleeping rooms during the night, and more directly through water used for ablution and washing utensils. That although the disease may possess infectious properties only during certain stages, and under certain conditions, it is probable that the disorder may be communicated directly, *during any stage*, to non-affected individuals, washing in the water which has been before used by persons the subject of this form of ophthalmia.

11. This explains how it is that a tendency to ophthalmia adheres tenaciously to the men of a regiment, and why, when an epidemic occurs, or a concurrence of exciting causes prevail, the regiment which has before suffered from ophthalmia will be sure to do so again.

12. From the fact of soldiers being gregarious, and peculiarly exposed to miasmatic influences, (while the vesicular stage manifests itself by no subjective symptoms,) we can explain how ophthalmia is a soldier's disease, and how difficult such disease, when once engendered, is of eradication.

13. This knowledge of the etiology of the disease sufficiently indicates the necessity of breaking up an affected regiment into small companies ;—the prohibition of such regiments from being stationed where ophthalmia is endemic, or the exciting causes to ophthalmia of any kind exist.

14. That it points also to the necessity for the largest amount of cubic space in the barrack rooms of such regiments, for full and free ventilation; and the supply of separate washing utensils for the men, with an unlimited supply of water, and the institution of bathing parades.

15. That the strictest supervision should be exercised in the prevention of men, already affected with vesicular or granular lids, joining companies or troops exempt from that disorder.

16. That, in the treatment of the disease perfect cleanliness, upstair wards thoroughly ventilated, and giving ample cubic space, with a separation of the milder from the more acute and advanced forms of the disorder, and exercise in the open air daily, seem to be the most important indications.

17. That any treatment,—by strong caustics, collyria, &c.,—with the view of cutting short at once the disorder, not only is inadequate to reach the tissue in which the morbid process runs its course, but is productive of mischief in tending to complicate the phenomena with those of our own production, and directly leads to opacities of the cornea, and chronic alterations in the tissues of the lids, *e.g.*, entropium; ectropium; deviations of the lachrymal puncta; zerophthalmos, &c.

18. That change of air is the best of all remedies in the advanced stages and in protracted cases.

19. That the disorder is occasionally kept up by malingering soldiers, and, when a suspicion of such exists, it is well to close the affected eye entirely, by strapping, and make the treatment uncomfortable in its nature.

20. That time forms an essential element in any treatment,—a tendency to recovery from the disorder in process of time being well marked.

Results of the Examination of the Eyes on board the Euryalus, March 13th, 1859.

Total Number.	Granular Lids.	Vesicles in Lids.	Tendency to Vesicles.	Distribution.
121	2	28	5*	Main deck only occupied. Nos. 5 and 6 being allotted to the boarders. Nos. 7, 9 and 10 to working prisoners, averaging about 40 men in each class.

The arrangement of halls and numbered wards is new. The lower floor of the prison on shore is divided into two halls containing 21 wards, each ward constructed to hold 16 men. A and B upon floor. C and D halls upstairs. So that a ward in either hall has the letter and number to distinguish it, *e.g.*, A 1, D 9.

Analysis of Cases in A Hall.

No. of Ward.	Vesicles in Lids.	Granular Lids.	Remarks.
1	7	None	
2	11	1	
3	8	None	
4	5	..	
5	2	..	
6	5	..	
7	1	..	1 case of engorged lids.
8	4	..	
9	..	..	
10	3	..	1 tendency to granulation at canthi.
11			
12			
13			
14			

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* Appearance of vesicles in these cases doubtful, rather vesicular than not, but not convincing to an unpractised eye.

Analysis of Cases in B *Hall.*

No. of Ward.	Vesicles in Lids.	Granular Lids.	Remarks
1	9	None	1 weak eyes and congested lids.
2	5	1 slight	
3	7	1 „	
4	4	2 „	
5	12	1	
6	11	2	
7	11	2	
8	5	1	and one engorged lids not carefully noted.
9	..	..	
10	8	1	Engorged lids.
11	8	2	
12			
13			
14			

Analysis of Cases in C *Hall.*

No. of Ward.	Vesicles in Lids.	Granular Lids.	Remarks.
1	3	..	
2	2	..	
3	1	..	
4	7	..	
5	8	1	Slight.
6	7	..	
7	5	3	Chronic cases, 1 just from hospital.
8	6	..	
9	9	1	From Euryalus.
10	4	..	
11	5	..	
12	8	1	Rather granular.
13	5	..	
14	9	..	Not well marked.

Analysis of Cases in D *Hall.*

No. of Ward.	Vesicles in Lids.	Granular Lids.	Remarks.
1	7	1	
2	12	1	Slight, never treated.
3	4	1	One now in hospital.
4	10	..	One lids engorged from childhood.
5	8	..	One has had ophthalmia.
6	8	1	
7	3	1	
8	9	1	
9	5	8	One of men whose eyes were sound, did not use the same water as rest.
10	3	..	One engorged lids.
11	8	..	One has had ophthalmia.
12	4	..	
13	..	..	
14	5	1	
15	6	..	One engorged lids.
16	9	1	

Results of the Examination of the Eyes of the Prisoners in the Prison, and on board the Euryalus, March, 1859.

Location.	Strength.	Granular Lids.	Vesicles in Lids.	Tendency to Vesicles.	Sound eyes.	Ratio.
Prison ..	620	44	298	65	333	
Euryalus ..	121	2	28	5	89	

When the Euryalus was examined, the upper deck only was occupied, the lower deck having been evacuated for some months; of the wards on the upper deck, five only were used.

Nos. 5 and 6, no cases noted. Warders.

7 contained about 38 men.
Vesicular 5, Granular 0.

9 contained about 40 men.
Vesicular 16, Granular 0.

10 contained about 40 men.
Vesicular 7, Granular 1.

Analysis of Cases treated in Hospital.

	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
January	..	..	2	..	2	2	13	3	8	3	9	1	3
February	..	..	2	..	4	2	16	4	2	3	10	8	3
March	3	2	2	2	4	1	11	2	3	10	7	4	4
April	2	2	4	5	2	..	5	20	4	5	2	8	1
May	1	1	4	..	1	..	4	12	..	5	2	5	4
June	1	..	..	..	1	2	1	5	..	4	4	5	6
July	1	4	2	..	2	1	..	4	2	4	12	7	4
August	1 relapse	1	..	4	..	1	..	3	8	5	1	4	4
September	..	1	3	..	..	..	1	1	4	4	4	2	3
October	..	2	1	..	1	4	1	2	4	4	4	..	5
November	..	2	2	1	..	8	2	3	2	3	3	1	4
December	..	..	1	..	..	12	1	1	2	11	3	4	3
Prison	8	9	14	9	11	26	39	52	31	53	57	44	35
Euryalus	..	4	8	1	4	7	15	8	8	7	4	5	9
Owen Glendower	..	2	1	2	2	..	..	..	..	1	..	..	..
Total	8	15	23	12	17	33	54	60	39	61	61	49	44
1st Quarter	3	2	6	2	10	5	40	29	13	16	26	13	10
2nd Quarter	4	3	8	5	4	2	10	24	4	14	8	18	11
3rd Quarter	1	6	5	4	2	2	1	7	14	13	17	13	11
4th Quarter	..	4	4	1	1	24	3	..	8	18	10	5	12
Total	8	15	23	12	17	33	54	60	39	61	61	49	44

Seat, Character, and Duration of the Disease.

Year.	Cases reported.	Relapses.				Idiopathic.		Eye affected.			Maximum in Hospital.	Minimum in Hospital.	Average duration in Hospital.	Results and Remarks.
						Without Corneitis.	With Corneitis.	Right.	Left.	Both.				
											days	days	days	
1846	8	..	2	1	..	5	..		not noted		53	3	17 ·4	1 eye lost.
1847	15	..	..	..	..	13	2	3	4	8	54	2	20 ·17	„
1848	23	..	4	1	1	14	9	6	7	10	206	2	21 ·	1 eye lost, 1 impaired.
1849	12	2	2	..	..	..	5	5	4	3	32	3	12 ·75	Nil.
1850	17	3	3	..	..	..	4	6	6	5	122	2	27 ·56	Nil.
1851	33	3	1 eye lost 3 and 2 doubtful	..	..	..	5	9	8	2 not noted 14	118	3	17 ·84	Granulations not noted in 5 cases.
1852	54	6	1 lost	..	..	..	6	7	11	3 not noted 32	73	3	13 ·32	5 granular.
1853	60	6	3, 1 lost	..	..	..	9	10	9	1 not noted 40	81	1	18 ·26	9 ditto.*
1854	39	7	1	..	..	..	8	7	15	3 not noted 14	..	..	..	20 ditto, 1 lost.†
1855	61	15	..	..	..	..	12	9	6	6 not noted 39	262	2	32 ·80	34 ditto.‡
1856	61	9	3	..	..	..	13	11	6	4 not noted 39	129	1	22 ·90	39 ditto, 1 lost.§
1857	49	5	1	..	1	..	18	11	7	6 not noted 25	247	2	33 ·16	23 ditto.
1858	44	5	3	..	..	..	11	14	6	8 not noted 14	127	1	20 ·05	25 ditto.

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* Infection first noted, one man getting the disease from lending an ophthalmic patient his towel.

† Netts, a Spaniard, a fruitful source of the disease.

‡ Hudson, a lunatic, greatly increased the area of disease in hospital.

§ O'Lochlan's eye lost.

Plate XII.

To illustrate Dr. Marston's Paper on Ophthalmia.

Diagram taken from a case of 'vesicular' lids with slight inflammation. Magnified. The drawing does not give so good an idea of the appearance as could be wished.

Plate XIII.

To illustrate Dr. Marston's Paper on Ophthalmia.

Fig. 1. Appearance of large vesicles removed from outer canthus at the retro-tarsal fold, close to the site of Kraüse's glands, magnified by a simple lens. Three vesicles in stage of vesicular congestion.

Fig. 2. Sago-grain bodies from the lid of G. Etheridge. The bodies had the appearance exactly of Sudamina, so translucent were they; but no collapse ensued upon pricking the vesicles. Obtained by transfixion with fine needle. Lower lid. The collections of cells are not represented sufficiently granular in the drawing.

Fig. 3. Appearance of cells in a small portion of granular lid, raised by a needle and removed. Chronic case. Disease in abeyance. Granulations firm, fleshy, with a smooth surface. Old granulation tissue, like cells upon the deeper wall of a sinus.

Fig. 4. More advanced stage, spindle shaped. Acetic acid has been added.

Fig. 5. Preparation shewing a simple follicle (crypt) from a normal eyelid. The interior contains granular cell-like bodies (masses of germinal matter) × 250. The boundary wall of the follicle is made too distinct and abrupt in the engraving. In nature the demarcation between the contents of the crypt and the surrounding tissue is made out with difficulty.

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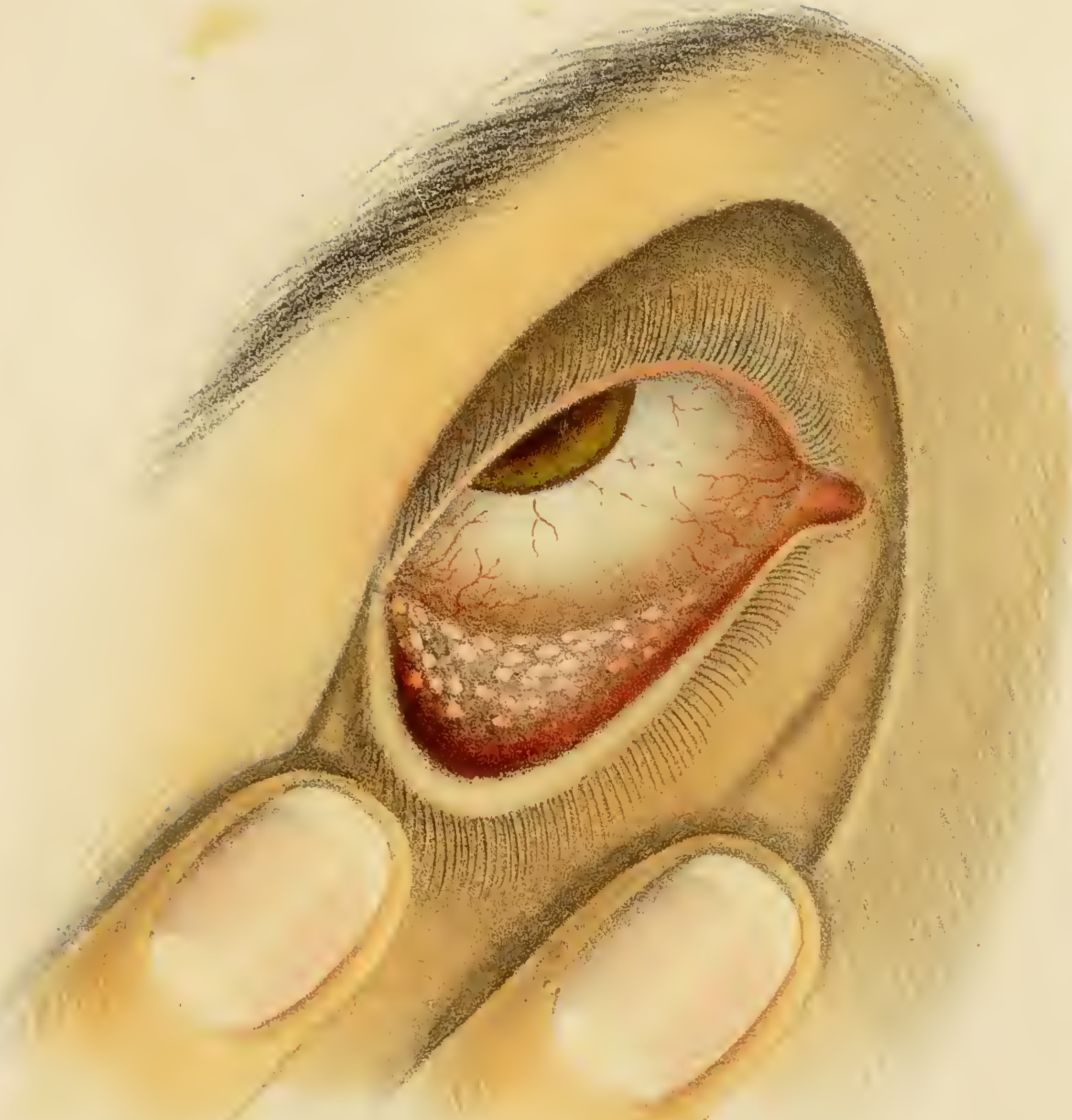

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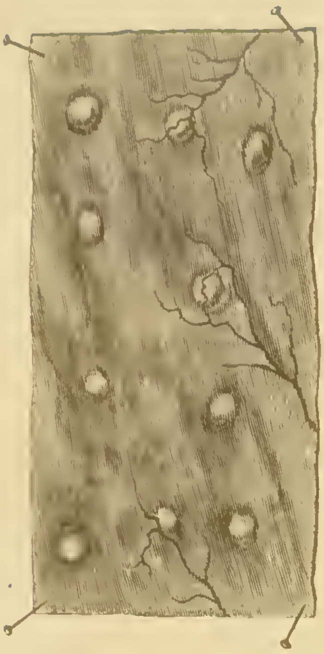
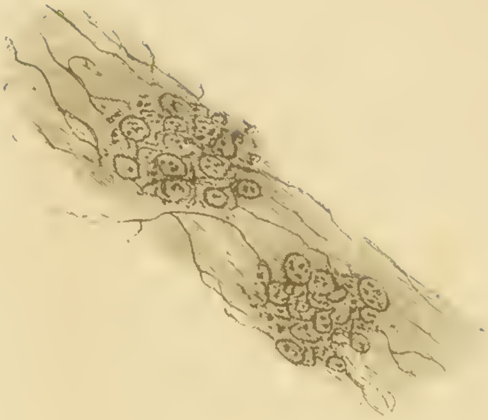




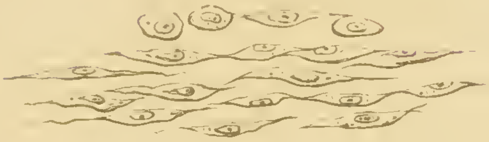
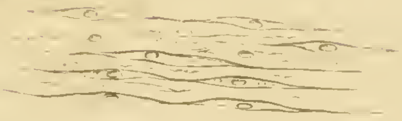
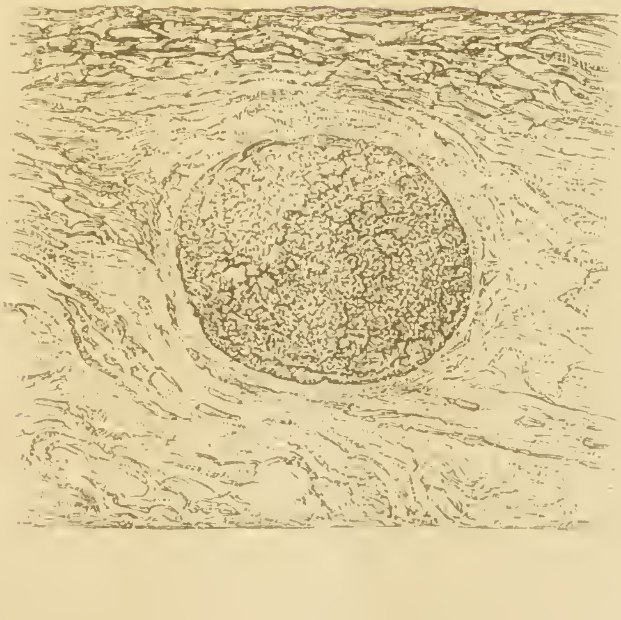


Fig. 4.





J. A. M. ad nat.

IVES

From Dr. Beale's Archives of Medicine, No. XII, 1862.

ON OPHTHALMIA.

By Jeffery A. Marston, M.D., Assistant-Surgeon, Royal Artillery.

(*Supplement to former Paper.*)

Learning that ophthalmia was prevailing in an epidemic form at the Central London District Schools, I applied for permission to inspect the affected children. Through the great courtesy and kindness of the medical officers I was permitted to do so.

It was with much interest that I witnessed for the first time in England an ophthalmia, prevailing in an epidemic form, under circumstances perfectly parallel with what is found in military life, and with symptoms so essentially similar to those I described in my last paper, as to leave no doubt of its identity with the military form.

I gather the following facts from the published report of the Committee, appointed in September, 1861, to inquire into the state of health of the children of the school:—

The Central London District comprises—

City of London Union,
East London Union,
West London Union,
St. Saviour's Union, Southwark,
St. Martin's-in-the-Fields Parish.

The then present number of children was 1,148.

The Committee was assisted in their inquiries by Mr. H. Haynes Walton.

The physical characters of the children at the different London Institutions were alike, inasmuch as they were gathered from a very low class, from crowded habitations, and presented the same general features, physically and morally, on their admission into the different schools.

It would appear that the health of the children at the Central London contrasted with that of the schools of other districts, principally, though by no means entirely, in the prevalence of ophthalmia. This disease had prevailed at the date of a similar commission in 1858.

The Committee advert to the disproportionate number of children at the Central London School affected with itch, and other cutaneous diseases, compared with other schools.

They remark upon the defective (excessive) ventilation and heating at the Central London Schools, and quote Mr. Haynes Walton to the effect that the disease was catarrhal ophthalmia, and not depending upon contagion or infection, nor excited by the mechanical irritation of dust, but that the *existing* cause of the disease was excessive ventilation.

Mr. Bowman, in 1858, had pointed out that the fresh air was admitted into the dormitories, directly from without, through a grating in the wall near the head of the beds. The corridors at Hanwell run the whole length of the building, from east to west, giving rise to strong currents of air. No distinct building existed as an infirmary. Under the head "*bathing*," the Committee remarked that the troughs in the boys' washing room were in an unclean condition. At Sutton School the Committee state that each child had a separate towel, which was not the case at the Central District Schools. (One towel to ten was the average.) At the Forest Gate School every child had fresh water for ordinary washing, and large plunge baths were supplied also with water constantly running in and out. No large day-rooms appeared to be set apart for the children during inclement weather, as at three of the other schools.

The Committee after regretting the existing state of bad health among the children of their school, as compared with the others, express their opinion that, "had the recommendations contained in Mr. Bowman's report in 1858 been rigorously enforced, much, if not all, the ophthalmic disease would have disappeared, certainly would have been much diminished in extent and danger."

Mr. Haynes Walton in his report October 1st, 1861, denominates the disease "catarrhal ophthalmia," existing in the mild and definite form, and not having passed into the purulent Egyptian, or military ophthalmia; that it was uncomplicated, that it was caused by atmospheric influences; that, though it prevails every year, it is occasionally epidemic, and had been very prevalent that year in London. Respecting its contagious or infectious nature he says "I am not aware that the matter conveyed from the eye of one person to another will produce it, such evidence as I can gather is against it; of its infectiousness I have no faith, and therefore I think that no advantage is to be got from isolation."

He appeared to consider the ventilation as the existing cause, and that the washing department was efficient, although he recommended, to be upon the safe side, that no one who had the disease should be allowed to wash with any healthy person, until he was quite well.

Mr. Walton did not consider that the prevalence of dust from the yard, had the least influence in causing the disease, as he says "irritation of the eye, arising from the intrusion of extraneous bodies, however minutely subdivided, is attended with very different symptoms."

Mr. Bowman in his report, in June 1858, appears to have recognised and spoken of the occasional epidemic character of the disease, and its spread by contagious influences, and to have pointed out the indications such a view would entail.

Owing to the continuance of ophthalmia, Mr. Bowman revisited the school upon 21st and 27th March, 1862.

Whatever might have been the disease hitherto, it was then no longer a simple malady, as regards its extent or consequences.

From Mr. Bowman's report of the latter date I gather, that ophthalmia was extensively prevalent, affecting about 686 of 1,162 children; 92 cases were separated and about 594 remained unseparated. Of these about 396 were cases relapsing after apparent cure, and 193 were slight commencing cases, not yet brought under treatment.

Mr. Bowman, writing for the perusal of non-professional men, says, "The Ophthalmia presents itself under four conditions, which I will enumerate as A, B, C, and D.

"*Condition A.*—Slight redness of inner corner of eyes. The inside of lids red. The eyes itch, look weak, and are often rubbed with the fingers. This, which is the common early stage, may vary in intensity, and may last for some time without attracting attention. To be detected early *it must be looked for.*

"It differs from ordinary catarrhal ophthalmia, on which I reported to you in 1858, by its persistency, and by its not tending to a speedy natural cure; by its liability to pass into the next condition (B), and also, as might be hence inferred, it differs in my opinion most essentially in its *cause.* I believe it to be propagated from one affected person to another.

"*Condition B.*—Worse stage of condition A. The eyes would be called *badly inflamed,* the edges and corners of the lids are more red, somewhat swollen and wetted with a good deal of discharge. There is itching, smarting, and intolerance of light. The inside of lids is of a lake colour, the membrane thickened and rough with small granulations. It is the same as condition A, but *with more inflammation.*

"*Condition C.*—is the most terrible form. The inflammation is so intense as to swell the lids rapidly with much pain and profuse suppuration"—purulent ophthalmia in short. "This severe variety presented itself in January, and has occurred only among the younger boys. There have been about 30 cases in all, and of these 7 eyes appear to have been lost.

"*Condition D.*—This I particularly specify in the present report, because of its importance in reference to the arrest of the disease, and its eradication from the school. It is the *convalescent* and at the same time the *relapsing condition,* in which an apparent cure having been effected, the treatment ceases, and the child is sent back among his fellows, until the symptoms again become urgent enough to call for his re-separation. I was informed by your medical officers that since June the children have been in many instances sent back from the ophthalmic ward into school, apparently cured, and then have had to be separated again within a few days, in consequence of a fresh attack.

"'Frequently in going round the school,' says Mr. Goodchild, 'we have seen cases among those who had been apparently cured, and who had consequently been allowed to return into school, and we have had to isolate them again. We have also at the same time seen *other new cases,* which had to be sent into the ophthalmic ward. Relapses have been frequent.'

"In this condition (D) of *convalesence* or *apparent cure*, but where relapses are so apt to occur if treatment is intermitted, the eyes have *nearly* lost their redness, but it quickly returns on slight excitement. There is very little discharge, but a little increase of redness is followed by a more abundant secretion, and the inner surface of the lid is found to be still too thick, and more or less granulated.

"By the mere intermission of treatment the discharge accumulates, the eyes get dirty, and the disease relapses.

"Of the 594 children whom I estimated as having ophthalmia, yet as mingling with the healthy children and not under any special treatment, a part were under condition A, and a part were under condition D, *i.e.*, they were either slight commencing cases, or nearly cured, or relapsing cases, in about the proportions already specified."

Numerous recommendations then follow upon the view, which he most strongly urges, of its infectious or contagious nature. "Under circumstances not easy to explain or to specify, but usually connected with over-crowding and want of cleanliness, the milder forms may pass with more or less suddenness into the more severe. In the present instance all the children seized with the more virulent form were already suffering from the less virulent, and several had been long under treatment. It would appear that in January and February the type of the disease changed in many instances; or else that a *single severe case having occurred in the boys' ophthalmic ward, others were contaminated by it*, for *the severest purulent cases were* not *at first isolated from the less severe ones.*

"It is noticeable that *all* the *worst* cases (form C) have been among the *boys*, none among the *girls*, although at the period of my visit girls were affected in greater number."

Extract from Mr. Bowman's Report, April 11th.

"For the single object of eradicating the ophthalmia a removal of the children who are now *healthy* for a time to some other suburban locality, or even to their own several workhouses, would seem to be a wise course, if only on their own account, and it would enable the officers to spread the suffering ones over a much wider area, afford them better ventilation, and give them a bed each."

Prevalence of the disease.—I made my first visit towards the latter end of April, and, examining individual children taken at random from those outwardly healthy, it was the exception to meet with a perfectly healthy condition of the conjunctiva.

Abstract from Three of Mr. Bowman's Weekly Reports.

Date.	Class A.	B.	C.	D.	Total cases.	Total children in School.
April 19	277	88	26	59	450	1,132
May 21	320	65	7	92	482	1,040
June 21	273	34	11	98	416	992

Its origin.—This is doubtful, but it may be remarked that Mr. Goodchild noticed that after the introduction from St. Pancras in 1858 of some children, affected with ophthalmia, the disease became more frequent and troublesome at the Central District Schools. Whether it took its origin from this source, or whether ordinary catarrhal ophthalmia, when protracted and widely prevalent among human beings living together under a defective hygiene, can assume the specific characters described, cannot be accurately determined. My own impression is so strong as to amount to a conviction that either of these conditions is adequate.

Its nature.—That form of ophthalmia which prevails in armies, and other bodies of human beings similarly circumstanced, and, whatever be its exact pathology, possessing the characters I have already described. The earliest and perfectly latent stages were comparatively absent, owing to the widely spread operation of exciting causes, and the epidemic influence. There were, however, large numbers of children affected with the sparsely shed "vesicular" or "sago grain" bodies, in different stages, as regards vascularity, limited to the retrotarsal fold of conjunctiva at the outer canthi, and offering no symptoms indicative of their presence, without a careful scrutiny of the lids. Entering the school-rooms, no one would have imagined from the appearance of the children the widely spread prevalence of the disease, such an absence was there of any appearance about the children's features, or the exposed surface of the conjuctiva to indicate it.

Mr. Bowman, recognising the presence of these "sago grain" granules, in many of the cases, holds strongly to the opinion, from their definite seat and character, that they must have their origin in a distinct physiological structure.

The causes.—Those of constitution, as congenital or acquired debility of constitution, such as must widely prevail among the children of the poorer population. That these are insufficient to account for all the cases, or the spread of the disease, will be apparent from the fact, that children of every constitution, physique, &c., have suffered in different degrees, just as was observed among the military, and in the Gibraltar convict establishment, where the disease attacked individuals of every type and conformation of body.

Contagion.—Into this I need not enter further than to remark that such an agency is generally allowed, and that Dr. Piringer, Van Roosbröeck, and others, have produced ophthalmia by inoculation of purulent discharges obtained from various sources. The latter, indeed, goes so far as to classify the Egyptian, military, and gonorrhœal forms under the same head, declaring that the diseases resulting from pus-inoculation are essentially the same, the different degrees of intensity resulting from the different sources (*quoad* intensity of inflammation), from which such discharge has been produced and obtained. The experience obtained from cases of artificial conjunctivitis by pus-inoculation is highly corroborative of the truth of Van Roosbröeck's statement, inasmuch as it has been found that the more intense the inflammation producing the pus used, the more intense the inflammation resulting from its use. Assuming that the disease *only* spreads in the *direct* way (which has not been yet proved), and that the contact of discharge from a diseased eye is essential to its production, it is still impossible to say in what stage *no* discharge whatever is present, for in the earliest, a little blinking in the sun, and slight gumming of the lids can be made out upon close enquiry; while in others, further advanced, we may often discover threads of muco-pus by eversion of the lids, although the symptoms appear very trivial. Granting the disease to be contagious, we have, it appears to me, not far to go to seek the causes for its epidemic prevalence at the school in question.

We have seen from Mr. Bowman's report that affected children had been allowed to mingle with the healthy. Fresh towels had been supplied daily, in the proportion of one to ten children. The children washed in wooden troughs (not a running stream)—by relays.

The bath is capable of holding about twenty; the dirty surface water drains off by one opening and fresh water flows in by another, so that the water is replenished without being *thoroughly renewed.* Up to the date that Mr. Bowman undertook the investigation into the causes of the epidemic, it does not appear that any means for the prevention of the spread of the disease were vigorously pursued. The first efforts were directed to the discovery, classification, and isolation of all cases of the disease, however slight.

Very many of the children slept two in a bed, and they occupied the same rooms by day, during wet weather, as at night.

The school rooms were divided by curtains (retentive of dust) for the purpose of facilitating class teaching.

The rest may be summed up in the expression, that the children are subject to those evils to which persons living in a gregarious manner must, in different degrees, be always exposed.

Of the *exciting* causes we have two of a well defined character present, and to which I have particularly alluded in my preceding paper, viz.:—1. *Catarrhal Causes,* as pointed out by Mr. Bowman and Mr. Haynes Walton.

2. *Dust.*—A large quadrangular yard exists, covered with an impalpable dust, particles of which penetrate everywhere. That such dust, *per se,* gives rise to a different and easily distinguished disease is true enough, but this is not by any means the case where other and more widely prevailing causes are present; then it takes its place as an irritant. Among the exciting causes Mr. Bowman speedily recognised the presence of dust as one urgently requiring removal.

RESULTS OF SOME ADDITIONAL OBSERVATIONS.

I. The reaction of the conjunctival secretion was tested in a great many instances. With one exception, the re-action was always weakly alkaline. The effect upon test paper was permanent also, indicating the presence of a fixed alkali. The lotions used were perfectly neutral to the same test paper.

II. With the view of corroborating the statement that pus was present in the air of ophthalmic wards, the bodies floating in the atmosphere of the wards were collected and examined, with negative results however, as regards pus cells. Dissatisfied with the very limited observations made in the wards, I have since used the aeroscope in a room, wherein some fluid pus was exposed. The bodies collected were examined microscopically. Beside dust, fibre, cotton, &c., there were organic bodies of various kinds and forms, (in very great part vegetable germs far smaller than pus cells).

Numerous minute germs (often as small as $\frac{1}{10000}$th inch in diameter) were found. That these were in great part vegetable, I think conclusive from the fact that sporules of fungus, and cellular bodies arranged in a linear series forming filaments, or mycelium, subsequently appeared upon the slides.

I found that if portions of cotton, wool, or lint, soaked with pus, be first desiccated, and the current of air passing over these be received by the aeroscope, some pus cells can be discovered with detached and isolated fibres of cotton; but no pus cells were found so long as the lint remained moist.

III. The worst cases and those in which the cornea sloughed or ulcerated, and sight was more or less destroyed were either compound in nature, the contagious ophthalmia engrafted upon the strumous form, or the purulent form of the disease in children of very delicate conformation of body and deficient powers of circulation.

As far as these unfortunate children were concerned they had all the advantages derivable from subsequent operative interference at the Moorfield's Ophthalmic Hospital, and with very gratifying results.

The sago-grain state of lid, advanced to the vascular or congestive stage, formed by far the larger proportion of the whole number affected.

Subsidence of the vascular phenomena was easily procured by mild treatment. Depletion and all lowering remedies were quite out of the question, owing to the tender age and defective nutrition of the patients.

IV. Mr. Bowman holds (of the truth of which I have no doubt) that it is well to *watch,* but not interfere with the quiescent stage, as astringent applications would probably only *induce* vascular phenomena.

In conclusion, I must thank Mr. Bowman for his kindness in giving me the benefit of the perusal of his reports. I may remark (with all modesty be it said) that I could not expect any thing in these papers to be new to a man of Mr. Bowman's observation and experience. He has most minutely pointed out the causes of its epidemic prevalence, and, by a series of most lucidly written recommendations, he has endeavoured to grapple with the disorder with a large measure of success. But the subsidence of such a disease must necessarily be gradual, not only on account of its obstinate nature, but because the necessary sanitary measures cannot always be carried out as efficiently and as early as would be desirable, owing to the conditions incident to a large pauper establishment. The Board of Management have shown the most praiseworthy desire to improve the hygienic state of the buildings by taking the steps recommended, regardless of cost. It may be hoped that a repetition of such an epidemic in future will be thus in a great degree guarded against.

Conceiving that it would be adding to the practical character of this paper, I have appended a series of sanitary suggestions.

Practical Recommendations to be put in force in a Regiment afflicted with Ophthalmia.

1. That all the men of an affected regiment be inspected by a medical officer at least once daily, with the view of removing at any rate all cases affording any discharge from the eyes.*

2. To make the men, as far as practicable, wash at a pump, having placed a sentry upon the spot with orders to see that every man brings his towel with him.

3. To place a sentry upon the lavatory to see that every man brings and removes his own towel, fills a basin with water from the tap, empties the same after washing, and refills the basin for his successor, who shall empty the water so left and refill the basin before using it.

4. To institute (if season permit) frequent bathing parades—four times weekly. It is better to make the men bathe in the evening in warm climates, both because it sends them to bed perfectly clean and refreshed after the duties of the day, and,

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* If a man affected with ophthalmia joins a regiment, it is better to billet him upon a company in which ophthalmia has been present than upon a company free from granular disease.

by encroaching upon their spare time, prevents it being spent in public houses, &c.

5. To avoid, as far as possible, the exposure of the men to the direct rays of the sun, dusty localities for parades, and the massing men together on parade.

6. Frequent exercise in the air in small parties of four to six men, whether affected or not with the disease,—provided that direct sunshine and easterly winds be avoided.

7. To have separate wards for ophthalmic cases, and it is recommended that the worst (purulent) cases be separated from the less acute and less advanced forms of the disorder.

8. Convalescent wards in hospitals, and convalescent rooms in the barracks, for men who have been treated, so that every affected case can be made to pass through a period of probation and observation before joining his regiment in the ordinary way. By this means the danger of contagion from relapsing cases will be avoided.

9. If the men of one room be affected, it is obviously well to clear out that room for a time, and to whitewash it.

10. To see that all bedding, &c., be daily exposed for some hours to the sun and air, and the barrack-rooms thoroughly ventilated. To ensure this being done efficiently day-rooms for the men are essential.

11. To increase as much as possible the cubic space for the inmates of the barracks.

12. The strictest attention to the latrines, urinals, &c.; closing those which are placed too near the barrack-rooms; directing that the tubs be placed outside the rooms during the night, and filled with water and some disinfectant during the day.

13. To discover, correct, and remove any such exciting causes as may be prevalent—*e.g.*, draughts in the rooms; dust in the barrack yards, and by selecting a cool part of the day and the shade for all necessary parades.

14. Cautioning men against the indiscriminate use of pocket handkerchiefs, &c.

15. The use of tow, cotton wool, or lint in hospital—the destruction of the same after use, with a strict prohibition against all sponges.

16. If the barracks be badly constructed, low in site, or otherwise defective, obviously a change is necessary, and encamping is far preferable, during even hot weather, to inhabiting such buildings. Splitting up the regiment into small bodies is to be strongly recommended also.

17. It is recommended when one eye only is affected, and affording discharge, that it be kept closed by means of

cotton wool, to prevent the discharge coming into contact with the sound organ, which is apt to occur during the night from the patient's fingers. The only objection to this plan is, that it tends to heat the eye and confine the discharge; this can only be guarded against by frequent inspection and syringing.

18. To ensure a prompt and efficient execution of any sanitary measures, it is necessary to obtain from the commanding officer one or more steady and vigilant non-commissioned officers with some soldiers to act as sanitary police. Great care should be exercised also in obtaining trustworthy, cleanly and attentive nurses for the sick, particularly in the purulent ophthalmic wards.

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